UNC Sea Grant

January 1988

COASTWATCH

A small man-made satellite rocketed into orbit in 1957. With Sputnik, the Soviet Union propelled a lackadaisical America into action. ■ First, there was a push to get a U.S. satellite in space. ■ Then, a young, enthusiastic John F. Kennedy challenged the nation. Not only will we put a man in space, he said, but we will lead the world in scientific discovery. ■ The early 1960s brimmed with optimism. It was a time of new frontiers. One of those was the ocean. ■ Athelstan Spilhaus got caught in the fervor. Dean of the University of Minnesota Institute of Technology, Spilhaus conceived the notion of a program to help the nation tap its ocean resources. ■ His notion became a reality in 1966, when Congress passed a bill creating a national Sea Grant Program. Sea Grant would be a university-based system combining research, extension and education. ■ Under the umbrella of a national office in Washington, programs were developed in every state that fronted the ocean or Great Lakes. There are 31 in all. ■ Using federal and state dollars, the programs tackle the nation's most pressing coastal problems—pollution, development, erosion, seafood utilization and fluctuating fisheries stocks. ■ Sea Grant programs provide grants to university researchers. And they employ extension agents to relay the results to the public. ■ In North Carolina, Sea Grant has been solving marine problems for 17 years. ■ In 1988, we will spend $1.8 million on 25 research projects, 1 education project, a crew of 12 extension agents and a handful of administrators. Nationally, the program is budgeted at $39 million. ■ You may never see the genius of our researchers at work, but their findings will have you eating a better fish stick, catching more crabs and clamming in cleaner waters. ■ At University of North Carolina laboratories, researchers will find new ways to detect harmful viruses in oysters and clams. ■ Near the dunes at Nags Head, coastal engineers will study the effects of erosion. ■ And on farmland in Hyde County, soil scientists will look at ways to keep farm runoff out of the estuary. ■ This month, *Coastwatch* will introduce you to our new research projects.

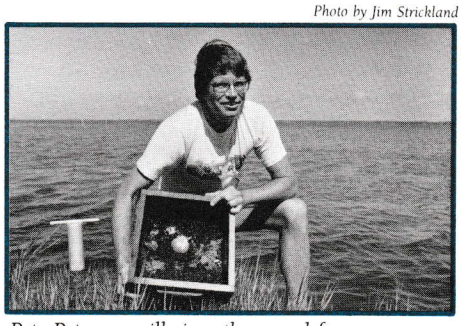
Photo by J. Foster Scott

fisheries

If you happen to catch a blue crab wearing a backpack in the Pamlico Sound, don't worry. The crabby crustacean is part of a scientific study, and he's wired for information. ■ In 1986, fishermen harvested over 23 million pounds of hard blue crabs valued at almost $5.5 million. In their soft postmolt state, the crustaceans brought crabbers another $700,000—a seven-fold increase since 1981. ■ The crab harvest dropped from the more abundant 30 million pounds of the early 1980s. And fisheries managers are concerned that development along the coast may affect vital crab habitat. ■ Tom Wolcott, a North Carolina State University zoologist, will examine the blue crab and its habitat. He is one of 12 Sea Grant investigators probing fisheries questions about population fluctuations, disease, pollution and recreational fishing. ■ Wolcott will investigate blue crab hideouts—places where the cranky crustaceans go to molt and mate. He wants to know what kind of habitat crabs prefer during these critical life stages. ■ To monitor the crabs, Wolcott will strap ultrasonic transmitters on their backs and track their paths with receivers and hydrophones. When the crabs molt, they'll leave behind their backpacks and clues to their habitat preferences.

Scallops are a valuable winter fishery; clams a year-round gold mine. ■ In fact, since the price for small hard clams rocketed from two cents apiece in 1975 to an occasional 24 cents apiece in 1987, clammers have plied the waters in record numbers. ■ But there may be trouble ahead. Hard clams are being overharvested, and state resource managers need information to make wise management decisions. ■ To define the problem, researchers must first define the areas clams call home. That is the work of Pete Peterson, a biologist at the University of North Carolina Institute of Marine Sciences. He'll also test a proposed rotation system for harvest areas to see if the mollusks increase in abundance. ■ As for the bay scallop, Peterson plans to learn more about the sweet mollusks' survival rate. Using the results, resource managers can determine whether it's feasible to increase populations by dispersing "seed" scallops in the estuaries.

Photo by Jim Strickland



Pete Peterson will sieve the sound for answers about hard clam and scallop populations

One year, thick schools of spot darken North Carolina coastal waters. The next year catching a spot may be likened to finding the proverbial needle in the haystack. ■ The exact causes for the fluctuations have eluded scientists. But Sea Grant scientists will test some theories. ■ NCSU zoologist John Miller and oceanographer Len Pietrafesa think the answer may lie in the fish's migration path from their spawning grounds to the estuarine nurseries. They believe that the ocean, inlet and estuarine currents play a role in the fish's migration and ultimately their survival. ■ To test their theory, Miller and Pietrafesa will use dye, floats and small plastic particles to simulate the path of fish carried in the currents. And they'll sample the path of fish at different points in their journey. ■ NCSU zoologists Jim Rice and Larry Crowder believe the population fluctuations may be linked to the size of larval fish as they enter the estuary. Their size could well determine how susceptible the fish are to predation and starvation—the most frequent causes of death in baby fish. ■ To test the theory, Rice and Crowder will use field and laboratory experiments to design a computer model that can predict how fish size affects the survival of larvae.

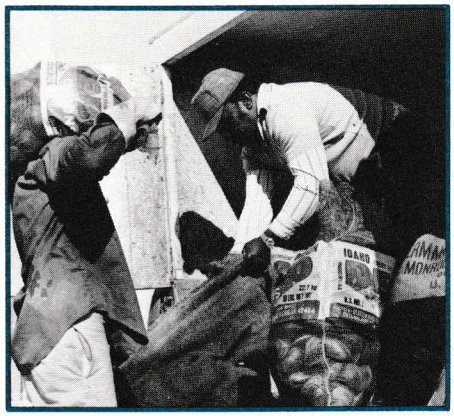
David Checkley will soon be getting an earful from the Atlantic menhaden. Checkley, an NCSU oceanographer, will examine the ear bones of larval menhaden to learn more about the fish's early development. ■ Larval fish add a protein layer to their ear each day the way a tree adds a yearly ring of growth. By using sophisticated equipment to examine the ear bone, Checkley can determine the menhaden's age and the water temperature at which it developed. ■ Water temperatures affect when and where the menhaden are spawned, when they begin to feed, what they eat and how they are transported to the estuary. ■ With Checkley's data, scientists can more readily predict the location of menhaden spawning and development. And fisheries managers will have a better understanding of the habitat needs of this economically important fish (see story, page 5).

Photo by Scott Taylor

Researchers will delve into the mysteries of fishery stock fluctuations

Fishing isn't work for all those who ply the sea. Some folks play at fishing. But don't think for a moment that recreational anglers aren't just as serious about bringing home the catch as their commercial counterparts. ■ David Lindquist, Larry Cahoon and Ileana Clavijo, biologists at UNC-Wilmington, will take a dive to answer important fish feeding questions about artificial and natural offshore reefs—the location of prime fishing spots. ■ Commercial landings of reef fish totaled over $4 million last year. And the reefs attract hundreds of recreational anglers who add dollars to the coastal economy. ■ Since 1986, the state has sunk $500,000 into enhancing or constructing 20 artificial reefs. ■ Lindquist, Cahoon and Clavijo plan to dive on natural and artificial reefs to learn more about the food sources of the fish they attract. The scientists believe that the ocean's soft bottom areas may be as important as the hard reef substrate in providing a fish's next meal. ■ Say a weekend angler wants to fish a particular artificial reef. How does he find out the reef's location? That's what Rick Perdue wants to know. ■ Perdue, a researcher in the NCSU Recreational Resources Department, would like to find out how anglers receive, use and relay information about recreational fishing. ■ Understanding the communications network will help resource managers who need to tell anglers about regulation changes and educate them about alternative species.

If fish could let their fins do the dialing, no doubt they'd call Ed Noga. He's a fish doctor. ■ A scientist at the NCSU School of Veterinary Medicine, Noga studies the bacteria and diseases that afflict our underwater friends. Last year, Noga succeeded in culturing a disease-causing parasite in the laboratory. It was a first. ■ Now, Noga will try to find out what natural factors—temperature, pH, salinity or minerals—will kill the parasite without damaging its fishy host. The information could be useful for pond-raised fish where disease can spell disaster.



Sea Grant research into shellfish contamination may mean safer clams for the table

Oysters and clams carry diseases of a different nature—human bacteria and viruses. ■ As filter feeders, oysters pass eight gallons of water through their systems each hour. And if the water is polluted with harmful bacteria and viruses, the oysters become contaminated, too. ■ In his UNC laboratory, Mark Sobsey will search for new ways to detect harmful human viruses in shellfish and their surrounding habitats. In his past project, Sobsey determined that present bacteria indicators were inadequate. ■ A method is needed to separate human and animal fecal contamination. The result may mean less areas are closed due to contamination and that safer shellfish will reach our tables. ■ In a sister project at UNC-Wilmington, Ron Sizemore will develop a way to track human waste contamination to its source. ■ Every time a human passes waste from his body, he emits billions of bacteria. These bacteria carry extrachromosomal particles called plasmids. These plasmids make one person's bacteria different from another's, and human bacteria different from animal bacteria. ■ By isolating the bacteria and taking water samples, Sizemore may be able to accurately pinpoint sources of pollution.

c o a s t a l p r o c e s s e s

The dream is an old one, reborn every time ten toes wiggle in the sun-baked sand. The dream is a house so close to the shore that the salt spray wets your lips and the ocean is at your front door. ■ Denis Bailey had the dream. ■ In 1970, the Virginia man and his family built a new home in South Nags Head right on the oceanfront. But the vacation is over. Bailey must move his house. ■ The ocean has come to his front door. ■ Bailey's story is just one of many associated with a severely eroding stretch of shore from Oregon Inlet to Whalebone Junction. In some places, up to 50 feet of beach per year have been chewed up and swallowed by the sea. ■ Normal erosion rates near inlets range from two to 18 feet per year, says Spencer Rogers, Sea Grant's coastal engineer. ■ But this is something different. This area or "feature" of high erosion appears to be moving north from Oregon Inlet at a rate of 800 to 1,000 feet per year. ■ Rogers believes this mobile monster is the result of eight hurricanes and the Ash Wednesday northeaster that widened Oregon Inlet more than 4,500 feet between 1950 and 1963. Afterward, the inlet began to fill in—with sand from the adjacent beach. ■ Aerial photographs document the erosion, but not enough of them have been examined to prove that a feature exists. ■ So Rogers and John Fisher, an NCSU civil engineer, will compare more photographs of the nine-mile stretch. With this, they can

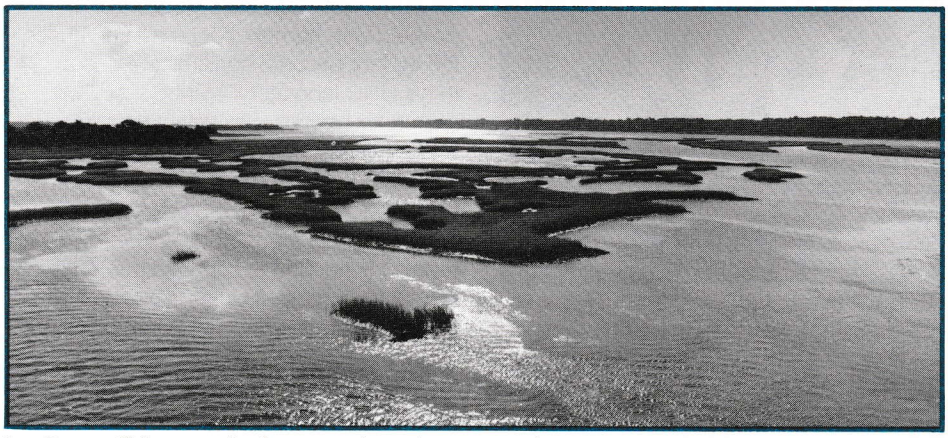
identify the erosion feature, its current position and the speed it is moving up the coast. ■ Their results may not help Denis Bailey now, but they can give other property owners and coastal managers a better indication of future shoreline changes near inlets. ■ Coastal managers will have something else to thank Fisher for soon. He and Margery Overton, an NCSU civil engineer, are developing a technique to predict dune erosion during storms. ■ For four years, the team has tested the relationship between wave force and dunes by using a small wave tank at NCSU and test dunes in the field. ■ Now they'll use tanks 300 feet long and 15 feet wide at Oregon State University to refine and validate their theories. ■ Their findings can be used to design dunes for shoreline protection and to evaluate potential flooding due to dune erosion during storms.

Photo by Scott Taylor

Sea Grant researchers will learn more about the forces that caused this erosion at Topsail Beach

e s t u a r i e s

Photo by Jim Strickland

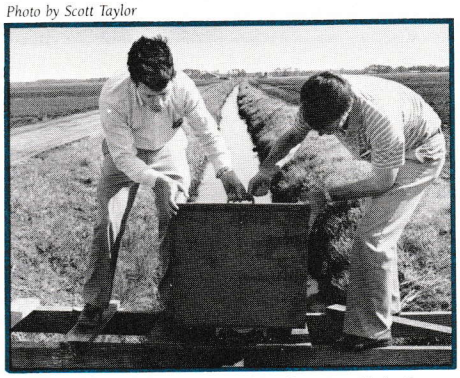


Sea Grant will focus much of its research on the estuary—the ocean's nursery

The Albemarle-Pamlico Sound system is the second largest estuary in the nation, stretching from Currituck to Carteret counties. It accommodates numerous finfish and shellfish nursery areas and supports diverse commercial and sportfishing industries. ■ That adds up to at least $130 million for the state each year. ■ But this valuable estuary is threatened. ■ Burgeoning populations in nearby counties add new pressures to water use. More sediments and nutrients like nitrogen and phosphorus find their way down the rivers into the sounds. ■ The results range from declines in some fisheries to nuisance algal blooms that surface in the summer. ■ Water quality managers are worried. They need more data on the current status of the sound system to find ways to protect it for future use. ■ Sea Grant researchers are hoping to fill the void. ■ Biologist Hans Paerl and physicist Richard Leuttich with the University of North Carolina Institute of Marine Sciences plan to develop a new way to estimate the productivity of the estuary. They'll look at how much food is produced by algae, the first link in the estuary's food chain. Knowing this will tell them how much food is available to other plants and animals. ■ Paerl and Leuttich will also examine the feeding activities of zooplankton, the next link in the chain. ■ To get the most accurate results, the team will sample the water at various points in Pamlico Sound. Then they'll simulate the water's turbid conditions by spinning the samples in a horizontal wheel and exposing them to different amounts of light. ■ Using this approach, the team can tell how the food chain varies seasonally and under different environmental conditions. ■ Researchers know that nutrients behave as fertilizers on algae just as they do on lawns and crops. They spur growth. ■ An extra dose of nitrogen or phosphorus can be good for corn, but in the estuary it causes problems—massive mats of nasty blue-green algae. And the flow of nutrients from sewage treatment plants, farms, forests and industries seems endless. ■ But so far, scientists don't know how many nutrients are too many nutrients. So biologists Don Stanley and Joseph Boyer of East Carolina University will experiment on a smaller scale. ■ They'll inject differing amounts of nitrogen and phosphorus into huge

tanks of water that resemble mini-estuaries. Then they'll record what types of algae occur and how fast they grow. ■ Stanley and Boyer also will use the tanks, which are located at the University of Rhode Island's Marine Ecosystems Research Laboratory, to look at how plants, animals and fertilizers recycle certain nutrients. ■ Their results may help water quality managers regulate the supply of nutrients seeping into the estuaries. ■ Two other Sea Grant researchers believe there may be a link between nutrients and the seagrass that grows in the estuary. ■ Where seagrass habitats along the East Coast have declined, so have important fisheries. Botanist Joanne Burkholder and zoologist Larry Crowder of North Carolina State University want to study how environmental factors and animals affect seagrass. ■ Using the tanks in Rhode Island, Burkholder will determine whether nutrients enhance seagrass growth or diminish it. Some nutrients may cause an overabundance of algae that would shade the beds and keep the grasses from producing food. The team thinks that animals further up the food chain also may affect seagrass growth. Crowder will use snails, fish, crabs and other grazers to see if they eat the algae or the grass. ■ Controlling nutrients at their sources—chiefly farms, wastewater treatment plants and industries—is one way to inhibit algal growth. ■ But to farm the wet soils of the coastal plain, growers must drain water from their fields. The fertilizer-laden runoff seeps into the estuaries. ■ Research has shown that good farm management practices reduce the loss of nitrogen from fields by as much as 50 percent. ■ But NCSU researchers Charles Reynolds, Wendell Gilliam and Wayne Skaggs want to predict with more certainty how management practices affect the movement of nutrients from the fields to nearby waters. ■ The team will compare fields with conventional drainage, controlled drainage and subirrigation. Then they'll monitor drainage from the test fields for nutrient levels. ■ This information will help them develop a model to predict the movement of nutrients to surrounding waters. ■ Once in the water, nutrients do more than just float downstream. They often become attached to sediments that also move downstream. When the biochemical conditions are right, the nutrients are released. ■ All of this movement leaves resource managers wondering just how many nutrients are in the system, where are they going and how they affect estuarine productivity. ■ Using lab and field experiments, East Carolina University scientists William Rizzo and Robert Christian plan to find out. The team will determine the role of sediments in removing or retaining nutrients in the state's rivers and estuaries. ■ Researchers John Wells and Larry Benninger of UNC-Chapel Hill have a another type of sediment in mind. They will examine large particles of silt and clay called "marine snow" that collect toxins from the water. ■ They'll photograph the underwater snow as it falls in the Neuse River to get an accurate picture of the shape, settling speed and alteration of these microscopic particles. ■ The team also wants to find out where the sediments go, at what rates, and how long they stay in the storage sites where they are deposited. ■ All of these projects aimed at establishing better water quality will have one big benefit—an increase in recreation and tourism in coastal North Carolina. ■ NCSU economists Kerry Smith and Raymond Palmquist want to know what North Carolina estuaries are worth in terms of recreational fishing and how their quality affects people's decisions to use them. ■ To find out, the researchers will analyze three economic models. Then they'll come up with a method for assessing the impact of management decisions on demand for recreation.

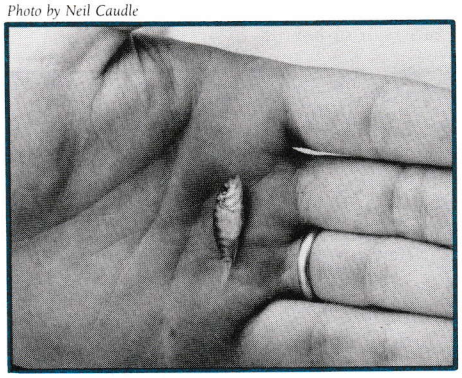
Photo by Scott Taylor



Wayne Skaggs and Wendell Gilliam will find ways to keep runoff on the farm and out of the estuary

a q u a c u l t u r e

Photo by Neil Caudle



This juvenile hybrid striped bass may be the foundation for the state's next major aquaculture industry

American appetites for seafood are getting bigger every year. To satisfy our hunger, we import half the seafood we eat. ■ There's simply too much demand and not enough supply. ■ Aquaculture, or fish farming, alleviates some of these problems. It provides a consistent quality and steady supply. ■ North Carolina already has a flourishing aquaculture industry. Last year, the state was the second largest producer of rainbow trout in the nation. ■ But Sea Grant research over the last 10 years has produced another candidate for aquaculture—the hybrid striped bass. ■ The hybrid is a cross between a striped bass and a white bass, and Sea Grant researchers have proven the fish can be farm-raised in ponds. Ron Hodson, associate Sea Grant director, thinks the hybrid will surpass the rainbow trout as the state's number-one cultured seafood. ■ Now the fish is receiving its first commercial test. In Beaufort County, farmer Lee Brothers is raising a hybrid crop. If he succeeds, the state will have the birth of a new industry. ■ Meantime, Sea Grant's aquaculture team—Hodson, nutritionist Margie Gallagher and economist Jim Easley—will perfect the science of raising

the hybrid. ■ Hodson would like to reduce the time it takes to produce a marketable fish. Now it takes about two years to get a 1 1/2-pound fish. ■ In a joint project with Maryland Sea Grant, Hodson will try to shorten that to one season by treating fish with a growth hormone. Fish already have growth hormones in their bodies. But increasing the amount may spur the fish to grow faster. ■ Hodson will determine how much hormone to apply and when in the fish's life cycle to apply it. ■ Like all creatures, fish need the right amounts of proteins and vitamins. Commercial feeds may not provide all of that. ■ In her ECU laboratory, Margie Gallagher learned that a healthy harvest of fish depends on the quality of the fish's diet as larvae. So she'll focus her work on the fish's first meals. ■ If Lee Brothers is as successful in his venture as Hodson believes, he'll sell his first crop of fish next year. But the market for hybrids is a new one, and it may offer some surprises. ■ NCSU economist Jim Easley would like to eliminate some of the uncertainty that goes along with a new industry. ■ He'll help fish farmers decide how much they should invest in their venture, what the costs will be, and when will be the best time to put their product on the market.

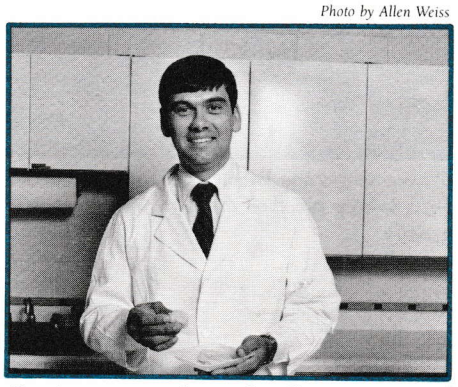
Photo by Nancy Davis

Ron Hodson prepares hybrid striped bass eggs for incubation

s e a f o o d

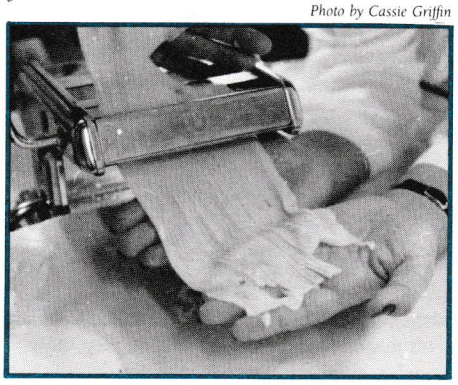
Two ECU anthropologists have an unusual assignment ahead of them. For the next two years, they will examine the minds of America's seafood consumers. ■ David Griffith and Jeff Johnson want to find out what folks know about seafood, what motivates them to buy it, and how they perceive seafoods versus other meats. ■ For answers, Griffith and Johnson will survey more than 1,000 people from Midwestern and South Atlantic states. ■ On the top of their list of questions is whether consumers have tried any of the surimi-based products on the market now. ■ Developed by the Japanese, surimi is fish paste that is molded into imitation seafood products such as shrimp, scallops and crab legs. Surimi seafoods are the fastest growing seafood products on the market. ■ But even so, their potential market may be limited. Consumers usually learn about seafood in restaurants. But many restaurants don't plan to serve surimi-based seafoods. ■ When Griffith and Johnson complete their survey, the surimi industry can use the information to teach consumers about their products. And the researchers will work with Sea Grant's Marine Advisory Service Director Jim Murray to develop an educational program to increase seafood consumption. ■ Eventually, consumer acceptance of surimi may help menhaden fishermen. Until now, menhaden has been ground into fertilizer or chicken feed, but it's never been served on the dinner table. ■ NCSU food scientist Tyre Lanier has perfected a method for making menhaden surimi. And a National Marine Fisheries Service pilot plant has been set up to make surimi products commercially. ■ Lanier has great expectations for surimi. Along with NCSU food scientist Donald Hamann, he will determine whether surimi could be a useful additive in other foods. ■ As surimi-based foods become popular, they create another problem—what to do with the waste the process generates. ■ Only about 20 percent of the fish is actually used for surimi. The remainder is discarded or used for chicken feed. ■ Along with Sea Grant seafood specialist David Green, Lanier will search for ways to turn surimi wastes into useful food additives.

Photo by Allen Weiss



Tyre Lanier tastes the results of his research efforts with surimi

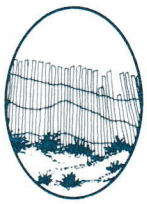
Photo by Cassie Griffin



Surimi is prepared for use in imitation crab legs

THE BACK PAGE

"The Back Page" is an update on Sea Grant activities—on research, marine education and advisory services. It's also a good place to find out about meetings, workshops and new publications. For more information on any of the projects described, contact the Sea Grant offices in Raleigh (919/737-2454). For copies of publications, write UNC Sea Grant, NCSU, Box 8605, Raleigh, N.C. 27695-8605.



More than 1,000 people came to the coast Sept. 19, but they didn't collect shells or reel in blues. They went fishing for trash as part of Beach Sweep '87.

The event brought people together from across the state to clean up the coast from Corolla to Calabash. In all, they collected more than 14 tons of debris.

Nature groups, science clubs, Girl Scout troops and other volunteers reported finding everything from plastic straws to a contact lens.

And for the first time in North Carolina, cleanup workers recorded each item found. The survey will be used to pinpoint waste sources and target further cleanup and education efforts.

One tally card included 393 plastic bags, 11 shoes, 51 toys, 357 Styrofoam cups and 370 metal drink cans. Other items found were 17 wads of fishing line, 18 disposable lighters and more than a dozen egg cartons.

Such litter poses danger for birds and other marine life. Heightened awareness of this problem means a cleaner beach and a safer place for people and animals.

That was the purpose of Beach Sweep, which was organized by UNC Sea Grant, the N.C. Division of Parks and Recreation, the N.C. Division of Coastal Management and the Office of Marine Affairs.

"People had a good time cleaning up their environment," says Andy Wood, an educator at the N.C. Aquarium at Fort Fisher and an area coordinator for Beach Sweep. "It looked to me like they really cared."

Plans are already being made for next year's cleanup. If you or your organization would like to help, write Lundie Spence at Sea Grant, Box 8605, North Carolina State University, Raleigh, N.C. 27695-8605.

In the April issue of *Coastwatch*, you read about Lena Ritter, an Onslow County fisherman, and her five-year struggle to save Permuda Island from development.

Ritter's work finally paid off in September when Gov. Jim Martin formally accepted the island as a part of the state's Estuarine Sanctuary System.

Permuda Island is a slender strip of land nestled in Stump Sound between Topsail Island and mainland Onslow County. Ritter had argued that development would endanger the productive shellfishing grounds around the island.

The island was turned over to the state Division of Coastal Management and will remain in its natural state. As part of the Estuarine Sanctuary System, the island will be used primarily for research and education.

The N.C. Division of Coastal Management recently beefed up the requirements for marinas to obtain operating permits. Many of the changes target pumpout facilities needed to empty sewage from boat holding tanks.

Commercial pumpout systems are available. But they can cost from $3,000 to $5,000.

There is an alternative.

A low-cost portable transfer tank can be made that eliminates the need for lengthy hoses and sewer lines at marinas.

It can be built in an afternoon and for about $250 with a copy of the Sea Grant Blueprint *A Portable Transfer Tank for Boat Waste.*

All it takes is a 30-gallon garbage can, a hand truck, a pump and some hoses. It can be rolled to the dock for pumping wastes from boat holding tanks. Then the tank is rolled back to a sewer connection on land and emptied into the marina's existing waste treatment system.

The Blueprint gives instructions for making the tank and lists other options marinas might use for waste disposal.

For a free copy, write Sea Grant and ask for UNC-SG-BP-82-1.

For years commercial fishermen have considered the cownose ray an enemy. They claimed the ray's healthy appetite was reducing their winter catch of bay scallops and subsequently the profits from the fishery.

The rays, fishermen said, were using North Carolina sounds as a roadside cafe on their fall migration south.

Fishermen asked the N.C. Marine Fisheries Commission to open the sounds to scalloping prior to the cownose migration.

But to see what kind of threat the rays really posed, Sea Grant researcher Pete Peterson set up some experiments.

He built a large corral in the sound and used monafilament line to lightly tether harvestable scallops in seagrass beds and along sandy bottom in the corral. The line kept the tides from rolling the scallops out of the enclosure.

Finally, Peterson let seven rays loose in the corral.

After one day, the rays behaved normally, feeding along the bottom. But not once during the seven-day experiment did the rays eat a single scallop.

To back up this experiment, Peterson also sampled areas where fishermen said the rays were dining on the scallops. He gathered samples three times during the fall.

In none of the areas did the abundance of legally harvestable scallops decline.

Peterson says his experiments prove the ray's reputation is unfounded and that the sounds could remain closed to scalloping until the mollusks reach a more marketable size in the winter.

Continued on next page

Thanks to those of you who contributed to ***Coastwatch.*** Your dollars will help us in our drive to keep the newsletter arriving in your mailbox on a regular basis. We sincerely appreciate your contributions and compliments.

If you'd still like to contribute, send your check to UNC Sea Grant. Make checks payable to North Carolina State University.

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Coastwatch is a free newsletter. If you'd like to be added to the mailing list, fill out this form and send it to Sea Grant, Box 8605, NCSU, Raleigh, N.C. 27695-8605.

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